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ABSTRACT
Covering the period since 1960, this annotated bibliography contains 97 items (most with abstracts) relevant to programed instruction in business and industry. The following appear: (1) 12 bibliographies, directories, and information sources, both foreign and domestic; (2) general considerations of programed instruction as a training technique (26 entries); (3) 30 descriptions of programs in office occupations education, anesthesiology, military electronics training, vocational retraining, manpower development, and other areas; (4) 22 research and evaluation studies, largely in various phases of military training; (5) program outlines and other instructional materials. Also included are notes on document availability, a list of ERIC Clearinghouse on Adult Education publications, and an order blank. (ly)

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PROGRAMMED INSTRUCTION IN BUSINESS AND INDUSTRY

Current Information Sources, No. 28

April 1970

ERIC Clearinghouse on Adult Education

ED 035 789

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April 1970

INTRODUCTION

This annotated bibliography covers documents on programmed instruction in business and industry flowing through the ERIC Clearinghouse on Adult Education (ERIC/AE) during the past 18 months. Many have been announced in Research in Education or in Current Index to Journals in Education, the best sources for keeping up with current literature in this field. These two abstract journals are now widely available in education libraries, universities, and school systems. Both of these catalogs should be scanned regularly to be informed of the latest literature on this subject.

RESEARCH IN EDUCATION
Superintendent of Documents
United States Government Printing Office
Washington, D. C. 20402
($21.00 a year domestic; $26.25 outside the U.S.)

CURRENT INDEX TO JOURNALS IN EDUCATION
CCM Information Corporation
909 Third Avenue
New York, New York 10022
($34.00 for 12 monthly issues)

We have sorted the entries very roughly into broad categories, but, since some documents relate to several categories, we recommend a quick scanning of the entire list.

This compilation continues the coverage of this subject started in a previous publication, Programmed Instruction in Adult Education, CIS-15, available from the ERIC Document Reproduction Service.

Most entries related to programmed instruction which appeared through the January 1970 issues of Research in Education and Current Index to Journals in Education have been assembled in this or in the previous publication, CIS-15.

Availability of documents. Many items come from standard journals, commercial publishers, or are available from their original sources. Many others, those with "ED" numbers, are available from the ERIC Document Reproduction Service in microfiche or printed copies. Please read carefully the note on availability and instructions for ordering from EDRS on page 38.

Joint Publication: We are grateful to the Adult Education Association for their cooperation in making this publication more easily available to their colleagues in business and industry.

Your help needed. Be sure to send two copies of reports and other materials you or your agency produce (whether published or not) for input into the ERIC system. Send them to:

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I. GENERAL: Programmed Instruction as a Training Technique

STEPS TOWARD PROFESSIONALIZATION OF TRAINING DIRECTORS. In PERSONNEL JOURNAL v45 n11 p662-695, December 1966. Ivancevich, John M. and Donnelly, James H. 7p.

To help the training director to select the most applicable technique to fulfill his needs research is reviewed on the effectiveness of seven methods: lecture, conference (discussion), programmed instruction, role playing, sensitivity training, television, and movie films.

NEW MEDIA AND METHODS IN INDUSTRIAL TRAINING; THE PRINCIPLES OF TRAINING DESIGN AND SOME NEW RESOURCES FOR IMPLEMENTING THEM. Robinson, John, Editor and Barnes, Neil, Editor. British Broadcasting Corporation, London, England. Available from BBC Publications, P.O.Box 1 AR, London, W.L., England (240). 221p. 1968.

Based on papers and discussions at a national conference organized by the British Broadcasting Corporation and the University of Aston in Birmingham in July 1967, this book outlines the princples of modern industrial training and the part that new learning resources can play in implementing these principles. It considers in particular programmed instruction, directed private study, group discussion, problem-solving, role-playing, and educational radio and television in improving the economy and efficiency of training for operators and craftsmen, technicians, technologists, supervisors, trainers, and instructors.

PRINCIPLES OF TRAINING. Holding, D. H. This document is available for 17s6d from Pergamon Press, Ltd., Headington Hill Hall, Oxford. 171p. 1965.

It is recommended that those who have the responsibility for devising training programs in industry be aware of the process of experimental psychology and submit new skills to fundamental analysis rather than imitate techniques that have worked in other skills. There is a lack of a sufficiently well-tested system of principles of training and of a scientifically validated system of training trainers. The available research evidence bearing on the problem includes the categories of: (1) feedback to the learner, (2) methods of physical, visual and verbal guidance to limit learning of errors, (3) the kinds of visual change or addition available to the trainer, (4) weighting and interplay of verbal and motor activities in learning, (5) effect of such conditions as speed and accuracy, massing and spacing, on the learning progression, (6) transfer of training and effective similarity between tasks, and (7) programmed learning and teaching machines.

SELECTION OF TRAINING MEDIA. Parker, James F., Jr. and Downs, Judith E. Wright-Patterson Air Force Base, Ohio. Aeronautical Systems Division, Matrix Corp., Arlington. Psychological Research Associates. U. S. Dept. of Commerce, Washington. Office of Technical Services 110p. September 1961.

This report is designed to assist a training analyst faced with the problem of selecting specific training aids and devices to be used in support of the development of the personnel subsystem of a military system. The translation of statements of desired personnel performance and capabilities, as presented in Qualitative and Quantitative Personnel Requirements Information and task analysis documents, into training objectives is discussed. The effectiveness of various training media in meeting specific training objectives indicated and justified in terms of objective evidence. An example is presented illustrating the manner in which training media are selected in support of a typical Air Force operator position.

TRAINING GUIDE; CONSTRUCTION. Kogan Page, Ltd., London, England. Available from International Textbook Company, Ltd., Intertext House, Parkgate Rd., London, S.W. 11, England. 18s. 94p. 1968.

This British guide is designed for training officers, employers, teachers, lecturers in architecture and related professional subjects, and others concerned with training and education in the construction industry. Chapter topics are: (1) the training picture (largely dealing with program planning and financial policy under the Construction Industry Training Board); (2) members, facilities, committees, training grants, and other features of the Board; (3) apprenticeships and other training schemes; (4) professional and qualifying bodies; (5) qualifications and examinations; (6) nonqualifying bodies; (7) training materials (publishers, books, periodicals and journals, programed instruction, and films and filmstrips).

ENGINEERING SYSTEMS FOR EDUCATION AND TRAINING. Proceedings of a conference in Arlington, Virginia, June 14-15, 1966. National Security Industrial Assn., Washington, D. C. Available from the National Security Industrial Association, 1029 15th Street, N.W., Washington, D.C. 20025. 170p. 1966.

A joint conference of personnel concerned with education and training of manpower in the Department of Defense (DOD), Office of Education, and the National Security Industrial Association, was called by the DOD to consider how the three organizations could collaborate. The DOD proposed using the enormous power of its procurement system to stimulate innovation in training and understanding of the human learning process. The magnitude, scope, and objectives of training in the DOD were emphasized. Leaders in education and industry set forth areas in which their organizations could contribute. Officers from the Army, Navy, Air Force, and Marines described scopes of training in their departments, techniques used, and anticipated needs. Specific uses of programmed instruction, closed circuit television, mock-up and training simulators were described. Also discussed were the present and anticipated status of computer-based instruction. Clusters of highly relevant areas of research in education were identified. Cost effectiveness, the need for development of course material and other software, and the need for a systems approach were recurrent themes.

TRAINING FOR DEVELOPMENT. Lynton, Rolf P. and Pareek, Udai. Available from

Richard D. Irwin, Inc., Homewood, Illinois 60430. 421p. August 1967.

An overview is presented of the broad aspects of training for national development, with some reference to needs and experiences in India. Part 1 differentiates training from other instructional activities and traces the contributions of individual participants and their organizations to the training process. Part 2 discusses organizational needs and individual motivation, the selection and use of such training techniques as simulation, role playing laboratory training, and programmed instruction, and stages in preliminary program design. Sections on the training process and posttraining examine training attitudes and activities, training styles, training groups as social systems, and subsequent contacts, in the form of evaluation and support, maintained by trainers with participants and their organizations. Part 5, which covers the training institution as a whole and the development of training as a profession, calls for a consistent training environment for trainees, a suitable institutional climate for trainers, and a systematic review of experiences accompanied by planned research and action.

NEW MEDIA IN TEACHING THE BUSINESS SUBJECTS. NATIONAL BUSINESS EDUCATION YEARBOOK, NUMBER 3. National Business Education Association, Washington, D.C. 210p. 1965. EDRS Order Number ED 026 512, price MF $1.00. Hard copy available from National Business Education Association, 1201 16th Street, N.W., Washington, D.C. 20036 $4.75.

A practical approach to the use of the new instructional media in business education subjects is presented in this yearbook. With the awareness of urgent problems and the expanded program for business education comes an appreciation for the instructional media, both old and new, that can be applied to everyday teaching.

TRAINING AND DEVELOPMENT HANDBOOK. Craig, Robert L. and Bittel, Lester R., editors. American Society for Training and Development, sponsor. 650p. 1967. Available from McGraw-Hill Book Company, New York.

To provide a broad reference source, from the viewpoint of the employer organization, for those responsible for developing human resources in any organization, this handbook includes materials for the sophisticated manager of a large training staff as well as the fundamentals of training for the beginning or part-time trainer. The levels of training covered range from apprentices to top executives.

TRAINING IN INDUSTRY. Glaser, Robert. (In INDUSTRIAL PSYCHOLOGY, by von Haller Gilmer and others. New York, McGraw-Hill, 1966 p167-197.) EDRS Order Number ED 018 700, price MF $0.25, HC $1.65. 31p. 1965.

This chapter in a larger work on industrial psychology deals largely with the need to specify training objectives through job analysis, uses of

testing in trainee selection, training variables and learning processes, training technology (mainly the characteristics of programmed instruction), the evaluation of proficiency, the value of experimentation, and facets of training (orientation and indoctrination, vocational and job skill training, supervisory and management education, specialized training). Major considerations in the training process itself are the proper amount of repetition and practice, task guidance by the trainers, prompt reinforcement, correct response discrimination and generalization by the trainee, the extinction of unwanted responses, effective training sequences, meaningful training materials, the effort and the degree of precision required, the nature of learning plateaus, the role of negative reinforcement, motivation, active learning, and the transfer of training to new tasks.

EDUCATIONAL INNOVATION. Winston, James. In TRAINING DEVELOPMENT JOURNAL; v23 n9 p34-35, 38-39. September 1969.

Prospects are discussed for effective use of programmed instruction (including computer assisted instruction) and related technology in industry, government, and education. Much greater precision in evaluating student progress and teacher effectiveness is foreseen as a result of such innovations, but the importance of clear learning objectives and continued experimentation is also underlined.

INNOVATIONS FOR TRAINING. McFann, Howard H. and others. George Washington University, Washington, D.C., HumRRO. Clearinghouse for Federal Scientific and Technical Information, AD-685-498, price MF $0.65, HC $3.00. 46p. February 1969.

Four papers on research and innovation in military training within the Army Training system deal with procedures for individualizing training, the Project IMPACT prototype system of computer assisted and programmed instructions, student motivation and performance, and prospects for the 1970's and 1980's, and the implications of research in learning processes, individual differences, and training management. Training strategies based on flexible curriculum planning are advocated, and individual factors (ability as affected by content, organization and sequencing, methods or media, student motivation, and training management) are described. The Project IMPACT study considers such elements as hardware, software, a decision making model, and instructional interaction. Concepts of performance, individual and group motivation, goals and rewards, and incentive schedules are discussed in the motivation study, together with issues in course management.

NEW MEDIA AND METHODS. Leith, G.O.M. and others. In NEW MEDIA AND METHODS IN INDUSTRIAL TRAINING, edited by John Robinson and Neil Barnes, London, British Broadcasting Corp. 1968, p42-96. 55p.

Part of a larger British work on industrial training design, several papers discuss recent developments in programmed instruction in Great Britain; directed private study through correspondence study and related means; the use of radio and tele-

vision for private study in Great Britain and elsewhere; uses of role-playing techniques and of educational broadcasting in group study in industry and commerce; and the role of problem-solving and case studies. A description of the accounting course set up by South West London College in 1965, an industrial relations role-playing exercise, and an example of the group use of television for a British Broadcasting Corporation industrial affairs course are presented, together with working definitions of educational technology.

CENTRAL TRAINING COUNCIL SECOND REPORT TO THE MINISTER OF LABOUR. Hunter, John. Great Britain, Ministry of Labour. Central Training Council. Available from Her Majesty's Stationery Office, London, 3s. 35p. June 1967.

In its first three years, the Central Training Council has set up 18 Industrial Training Boards and guided them on such matters as trainer, management, and clerical training. The Boards administer a grant and levy system to distribute equitably the cost of training and to ensure that training is adequate, recommend the syllabus and training methods to be used, and set down flexible training outlines in fields where precise guidelines are not desirable. One of the Boards' innovations is the decision that craft skills be identified by the module of time needed to learn a given skill, based on the capacities of each trainee and the requirements of his employer. Modules can also be used to modify initial training later in the craftsman's career. The Boards have established off-the-job-training centers, group training schemes, and encouraged general education through paying training grants only to firms offering day release to employees.

TRAINING RESEARCH UTILIZING MAN COMPUTER INTERACTIONS, PROMISE AND REALITY. (Presented as part of the Avionics Panel Program on Natural and Artificial Logic Processors, Advisory Group for Aeronautical Research and Development, Athens, Greece, July 1963.) McClelland, William A. George Washington University, Washington, D.C. Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, price MF $0.65, HC $3.00. 19p. June 1967.

The paper was presented as part of the Avionics Panel Program on Natural and Artificial Logic Processors, sponsored by the Advisory Group for Aeronautical Research and Development, NATO. Several conceptual propositions in regard to man and the computer are offered. The nature of training research is examined. There is also a brief categorization of human behavior to suggest some of the uses and some of the difficulties in the utilization of computers in training research. The role of the training research psychologist dealing with large groups of people in mass instruction in a military setting is discussed, as is the importance of the computer for data processing and as a tool for simulating complex behavior.

MATHETICS, A SYSTEM OF PROGRAMMED INSTRUCTION. Rehabilitation Research Foundation, Elmore, Alabama Materials Development Unit. EDRS Order Number ED 024 601, price MF $0.50, HC $3.15. 61p. April 1966.

The four papers contained in this document were written by three members of the Materials Development Unit, Rehabilitation Research Foundation, Elmore, Alabama. These papers were selected for joint distribution to present the authors' experiences with the mathetical system in light of current mathetical programming activities. "The Two Meanings of Mathetics" and "Mathetics - The Ugly Duckling Learns to Fly" are an overview of the mathetical system and the techniques employed by the mathetical analyst and writer. "Mathetics in Industrial and Vocational Training" describes the activities of major mathetical programming units in the United States. Finally, "The Development and Production of Mathetical Programs - A Case Study" describes the major production procedures of programming units.

PROGRAMMED INSTRUCTION. Garner, W. Lee. Center for Applied Research in Education, Inc., New York. Available from the Center for Applied Research in Education, Inc., New York. 128p. 1966.

This book puts programmed instruction into perspective by outlining its history particularly in context of education and training. It outlines the basic theories, principles and techniques of applied programmed instruction; explains the making of a programmer in industry, military and education, emphasizing the problems in training a programmer and the varieties of programs; and shows how programmed instruction is used in training systems.

MILITARY APPLICATIONS OF PROGRAMMED INSTRUCTION AND MANAGEMENT CONSIDERATIONS IN PROGRAMMED INSTRUCTION. Smith, Robert G., Jr. George Washington University, Washington. AD-647-840, 17p. February 1967.

The first of these two papers presented at a 1965 NATO Conference on "The Military Applications of Programmed Instruction" arranged by the advisory Group on Human Factors describes the influence of military applications of programmed instruction on the development of modern concepts of programming and specific applications that might suggest ways in which programmed instruction could be used. A review of the use of programmed instruction in the armed forces includes discussion of the 90-90 quality standard. The second paper answers questions training officers considering the use of programmed instruction are likely to ask: 1) what gains can be expected from programmed instructions, 2) underwhat conditions should it be used, 3) where can programs be obtained, 4) what problems are associated with getting programs, and 5) how to develop a programming capability in an organization.

USE OF PROGRAMMED INSTRUCTION IN INDUSTRIAL TRAINING. Memorandum Number 3. Great Britain, Ministry of Labour. Central Training Council. M-3. Available

from Her Majesty's Stationery Office, London. 5p. February 1966.

To use programmed instruction in industrial training, (1) training needs must be clearly identified and precisely stated, (2) the learner should be actively involved in learning, (3) the units of information should be small enough to be readily assimilated by the learner, (4) instruction should normally be self-paced or matched to the learner's personal learning speed, and (5) there should be immediate feedback of results for effective learning. Industrial training boards should consider establishing small teams of training specialists, well qualified in job analysis and program writing, to analyze and cater specifically for the needs of their own industries in close coordination with training officers in individual companies.

MANAGING THE INSTRUCTIONAL PROGRAMMING EFFORT. Rummler, Geary A., editor and others. Michigan University, Ann Arbor, Bureau of Industrial Relations. Available from the Bureau of Industrial Relations, Graduate School of Business Administration, University of Michigan, Ann Arbor. 293p. 1967.

The compendium of case histories on the development of programmed instructional materials describes attempts by graduates of a programming workshop to solve management development problems in their own organizations. Areas of discussion are: behavioral technology and manpower development, the programming process, contract (custom-made) programs, published programs, inplant programming, means of introducing programs into the field, approaches to program administration in the field, development of a project by the American Bankers Association, and major variables to be considered in choosing a program source. The outcomes, both sucessful and unsuccessful, of these efforts suggest that the major causes of programming failures are administrative or managerial rather than technical.

A SYSTEMS APPROACH UTILIZING GENERAL-PURPOSE AND SPECIAL-PURPOSE TEACHING MACHINES. Silvern, Leonard C. Hughes Aircraft Co., Los Angeles, Calif. Available from Hughes Aircraft Company, Ground Systems, P.O.Box 90515, Los Angeles, California. 16 November 1961.

In order to improve the employee training-evaluation method, teaching machines and performance aids must be physically and operationally integrated into the system. Thus returning training to the actual job environment. Given these conditions, training can be measured, calibrated, and controlled with respect to actual job performance standards and criteria, thus avoiding other, low-fidelity simulations as performance measures. This document is based on a presentation to the special AMA Conference on programmed learning and teaching machines, American Management Association (Los Angeles, Claif.).

SIMULATION GAMING FOR MANAGEMENT DEVELOPMENT. McKenney, James L. Harvard University, Boston, Mass., Business School. Available from Division of Research, Harvard Business School, Soldiers Field, Boston, Mass. 02163. 189p. 1967.

The present Harvard Business School Management Simulation Game was developed as a teaching device for classes of 20 or more students grouped into four- and five-man teams called "firms". Each firm competes with others in an "industry," an economic abstraction of a consumer goods market programmed to be simulated on an electronic digital computer. Budgets prepared by each firm are run to produce a set of accounting statements on which the participants determine the next set of moves. The model requires about ten hours of individual analysis per move, with three hours allowed for each move. The faculty acts as the Board of Directors, raising questions and probing students' reasons for their decisions. The simulation was developed to integrate the functional courses of marketing, production, and finance into an overall strategy implementation exercise, to involve participants in the utilization of analytical techniques in a dynamic problem solving activity, and to require individuals to cooperate and communicate over a period of time to solve a complex problem. War gaming as the basis for business gaming, the evolution of the simulation model, and how it has been used in various business games are discussed.

COLLECTED PAPERS PREPARED UNDER WORK UNIT FORECAST; DEVELOPMENT OF A METHOD OF FORECASTING TRAINING DEMANDS IMPOSED BY NEW ELECTRONIC WEAPON SYSTEMS. McClelland, William A. and others. George Washington University, Washington, D.C. Clearinghouse for Federal Scientific and Technical Information (AD-673-026, MF $0.65, HC $3.00) 43p. 1968.

Research in the area of electronics maintenance is discussed in this publication. The papers include: "The Approach and Results in the FORECAST I Experimental Study;" by William A. McCelland; "Cue Response Analysis of a Maintenance Task" by Edgar L. Shriver; "Increasing Electronics Maintenance Proficiency Through Cue-Response Analysis;" by Edgar L. Shriver, C. Dennis Fink, and Robert C. Trexler; "Using Cues and Responses to Translate Logical Into Practical Troubleshooting;" by Edgar L. Shriver; "SNAP Programming," by Edgar L. Shriver and Robert C. Trexler; and "Two Jobs for One in Electronics Maintenance," by Edgar L. Shriver and Robert C. Trexler. The forecasting of training requirements for new weapons systems, task analysis for an experimental weapon system training program, the use of low-cost electronics maintenance into the functions of planning and execution are among the topics treated.

PROCEEDINGS OF THE NAVAL TRAINING DEVICE CENTER AND INDUSTRY CONFERENCE (2nd, November 28-30, 1967). Naval Training Device Center, Orlando, Florida. Clearinghouse for Federal Scientific and Technical Information, (AD-672-567, MF $0.65, HC $3.00) 360p. November 1967.

This report consist of 40 conference papers actually presented, and four others submitted but not presented due to lack of time. It concentrates on the technical problems confronting organizations having a prime interest in

simulation for training, and stresses the cooperation of the military educator and the technical community to achieve a product that satisfies the training mission, is cost effective, and is training time effective. Programmed instruction, display systems, logistics, value engineering, human engineering, flight training, transfer of training, management planning and contract negotiation are among the topics discussed.

REQUIREMENT SPECIFICATIONS FOR A DESIGN AND VERIFICATION UNIT. Pelton, Warren G. and others. Technomics, Inc., Santa Monica California. Final report, 15 May - 15 October, 1968. Clearinghouse for Federal Scientific and Technical Information (AD-677-479, MF $0.65, HC $3.00). 247p. October 1968.

A research and development activity to introduce new and improved education and training technology into Bureau of Medicine and Surgery training is recommended. The activity, called a design and verification unit, would be administered by the Education and Training Sciences Department. Initial research and development are centered on the application of multimedia instructional packages; self contained learning materials and their associated devices, designed using programmed learning principles. A second stage of activities, and milestones are presented. The appendixes describe considerations for selecting a computer, costs and features of various information displays and other computer peripherals, specific computer languages, and the UNIVAC STAT-PACK statistical package.

THE ROLE OF PROGRAMMED INSTRUCTION IN COMPANY TRAINING AND DEVELOPMENT PROGRAMS. Pressley, Trezzie Abram. Arkansas University, Fayetteville. University Microfilms Order No. 66-7059, price MF $3.00, Xerography $8.80. Ph.D.Thesis. 195p. 1966.

Data were obtained from responses received from 104 companies which were using programmed instruction in their training programs and from 176 employees within these companies. Companies of all sizes were using programmed instruction; however the vast majority had used programmed materials with one-half or less of their employees. Almost 3/4 of the companies were using the method in training new workers and almost half were using it in retraining the work force in new job areas. Most were using programs in text form; half had developed their own programs; others were purchased. Company studies showed that programmed instruction has the advantages of greater retention by the learner, training time saves, and lower training costs. Both employers and employees were very favorable toward the use of programmed instruction.

II. BIBLIOGRAPHIES, DIRECTORIES AND INFORMATION SOURCES

U. S. GOVERNMENT RESEARCH AND DEVELOPMENT REPORTS. Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia. Semi-monthly. Subscription $22.00 per year ($27.50 foreign); single copy $3.00. Order from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22141.

A semi-monthly abstract journal announces reports of U.S.Government-sponsored research and development released to the public through the Clearinghouse by the Atomic Energy Commission, Department of Defense, National Aeronautics & Space Administration, and other United States government departments and agencies; United States government-sponsored translations; and some foreign reports written in English. Reports are announced in 22 subject categories, and include military training, human factors, training devices, evaluation of training, learning, cross cultural training, leadership, management development, job analysis, industrial training, urban planning, and community development. They are indexed by subject, personal author, corporate author, contract/grant number and accession/report number.

INDUSTRIAL TRAINING RESEARCH REGISTER. Great Britain. Ministry of Labour, London, England. EDRS Order Number ED 015 373, price MF $0.75, HC $6.60. 13 p. March 1967.

In this classified register of current and recently completed studies of industrial training in Great Britain, individual projects are arranged by the item number judged most important, and the numbers of other relevant industrial research projects are inserted at the end of each section to provide cross references. Descriptions include the title and wherever possible, a short summary of objectives and procedures, the time and place of the research, the principal researchers, and the sponsoring organization. National aspects (government reports, manpower policy and planning, legislation), components of the educational system, work environments (including the effects of organizational climate and automation), training specialists and their activities, means of identifying training needs, types of trainees and the selection and recruitment of trainees, administrative aspects (types of training, objectives, facilities, scheduling subject content), training methods and learning aids, and evaluation techniques are the broad categories represented.

BACIE REGISTER OF PROGRAMMED INSTRUCTION IN THE FIELD OF EDUCATION AND TRAINING IN COMMERCE AND INDUSTRY. Volume Two, 1968. British Association for Commercial and Industrial Education, London (England). Available from British Association for Commercial and Industrial Education, 16 Park Crescent, Regent's Park, London, England; price for members 30s and 45s for non-members. 203p. July 1968.

The British Association for Commercial and Industrial Education has included in its register of annotated programmed instructional materials: programs

available in the United Kingdom; programs dealing with industrial and commercial training and related further education; and information as supplied by the authors or producers of programs. The areas covered are: chemistry; commercial subjects (12 subheads); computers; electricity; electronics; engineering (13 subheads); industrial processes and techniques (6 subheads); management subjects (5 subheads); mathematics (11 subheads); physics; police procedures; sales (4 subheads); training (2 subheads).

SOURCES OF PROGRAMMED INSTRUCTION. Hickey, Albert H. In TRAINING IN BUSINESS AND INDUSTRY; v6 n4 p54-56. 4p. April 1969.

A guide to programmed instruction for new training directors in industry, provides information on where to find off-the-shelf programs to fit their needs, how to administer and evaluate a program, and how to set specifications for cutsom-made programs if suitable programs are not available off-the-shelf. A 12-item list of "classics" in the field is included.

A NATIONAL CENTRE FOR PROGRAMMED INSTRUCTION FOR INDUSTRY. Kay, H. and Dodd, B. In INDUSTRIAL TRAINING INTERNATIONAL; v2 n11 p484-485. November 1967.

The National Centre for Programmed Instruction for Industry at Sheffield University, established by the Ministry of Labour, will collate information on programmed instruction, offer advice on its use, and suggest and promote further research. Queries on specific training issues, on worldwide developments and their effects, and how material may be obtained will be answered. As the key issues are identified, the center will publish for general distribution the pertinent information it has collected. The center will compare similar programs and advise on the suitability of a particular system for an individual firm, and, to a limited extent, carry out field studies.

AN ANNOTATED BIBLIOGRAPHY ON THE DESIGN OF INSTRUCTIONAL SYSTEMS. Smith, Robert G., Jr. George Washington University, Washington. Clearinghouse for Federal Scientific and Technical Information, AD-653-128, price MF $0.65, HC $3.00. 140p. May 1967.

The bibliography, part of a Human Resources Research Office series on the technology of training, is divided into seven major areas--generalities of systems analysis and design, training systems (with evaluation of specific systems), techniques and media for presenting knowledge, practice of knowledge, practice of performance, management of students (furtherance of the learning process through such means as motivation, environment, and adjustments to individual differences), and additional matter relevant to instructional systems. The major topics are further subdivided where applicable.

EDUCATION AND TRAINING FOR EFFECTIVE MANPOWER UTILIZATION; AN ANNOTATED BIBLIOGRAPHY ON EDUCATION AND TRAINING IN WORK ORGANIZATIONS. BIBLIOGRAPHY SERIES, 9. Mesics, Emil A. New York State University, Ithaca. Available from Distribution Center, New York State School of Industrial and Labor Relations, Cornell University, Ithaca, New York 14850. Price $2.50. 165p. March 1969.

Designed as a ready reference source on training practices and theories in work organizations, this annotated bibliography cites 109 items on general aspects of training (including the historical development of training and the identification of needs), followed by eleven bibliographies and by over 600 other works on manual and clerical skill training, technician and engineering training, supervisory training in industrial and clerical settings, organizational planning and management development, specific training methods and techniques, audiovisual aids, manpower planning and development, the evaluation of training programs, and United States Manpower policy.

PROGRAMMED INSTRUCTION GUIDE. Northeastern University, Boston, Massachusetts. Educational Technology Information Center. Available from Entelek Inc., 42 Pleasant St., Newburyport, Massachusetts, 01950. 301p. 1967.

Originally developed for the use of teachers and industrial training personnel interested in the availability of programmed learning materials, this guide is based on the programmed media collection of the Educational Technology Information Center, Office of Educational Resources, Northeastern University. It will be updated and published twice a year. It includes lists of bibliographies (written since 1962) of programmed learning materials available commercially, and lists of periodicals, producers, and devices. In the Data Bank, 1,773 programs (4,036 separate pieces) are listed and evaluated. The following information is given for each: author, title, classification number, supplementary material included, subject matter covered, program source, style, source of information about the program hours needed to complete it, level, cost, availability, and publication date. Evaluative data for each program includes specification of terminal objectives, program prerequisites, target population, content, integral tests, and results of field trials. Data on programs published outside the United States will be included in the next edition.

SELECTED BIBLIOGRAPHIES COVERING TWENTY-SEVEN TRAINING SUBJECTS. American Society of Training Directors, Madison, Wisconsin. Available from the American Society of Training Directors, 2020 Madison Ave., Madison, Wisconsin 53711. Price to members $2.00, to nonmembers $4.00. 96p. 1961.

Selected bibliographies of books and articles that were helpful to training men faced with practical problems were compiled by the members of the American Society of Training Directors who served as Training Brokers for the Training Trading Post Session at the 17th Annual Conference (1961) of the

Society. They are arranged under the topics: appraisal, case study, communication, computer programmer, cost reduction, creative thinking, job instruction, leadership, listening, need finding, performance standards, presupervisory, role playing, sales, sensitivity, simulation for training (business games), supervisory, teaching machines, training manuals, university management programs, visual aids, and writing. Most of the material cited was published in the 1950s.

MAINTENANCE TRAINING MEDIA, AN ANNOTATED BIBLIOGRAPHY. Valverde, Horace H. Aerospace Medical Research Laboratories, Wright Patterson AFB, Ohio. TR-67-151. Clearinghouse for Federal Scientific and Technical Information, AD-673-371, price MF $0.65, HC $3.00. 109p. 1968.

The training analyst must be able to specify training media requirements during the early stages of weapon systems development. Also, training specialists often need to make training media selections for center or base level courses. This report provides such personnel with information to aid them in developing training equipment requirements. The selected annotated bibliography contains 200 references to government sponsored training media research and development reports from 1950 through 1966. All are available through the Defense Documentation Center (DDC) to military agencies and their registered contractors. Each reference bears a DDC Accession Document (AD) number. Reports on various technical aspects of training media (except operator training) are included; therefore, the information should be useful in other fields of technical training.

A BIBLIOGRAPHY OF REPORTS ISSUED BY THE BEHAVIORAL SCIENCES LABORATORY --ENGINEERING PSYCHOLOGY, TRAINING PSYCHOLOGY, ENVIRONMENTAL STRESS, SIMULATION TECHNIQUES, AND PHYSICAL ANTHROPOLOGY, APRIL 1946-DECEMBER 1965. Stevenson, Sandra A. and Trygg, Lavon E., comps. Behavioral Sciences Laboratory, Wright-Patterson Air Force Base, Ohio. 150p. June 1966.

The Behavioral Sciences Laboratory conducts research and development in the fields of human engineering, psychophysiology, physical anthropology, training, and simulation techniques. The Human Engineering Division executes research and development on human performance capabilities and limitations as they relate to operation and maintenance of aircraft, missile and manned space vehicle systems. The Training Research Division does research and technical development in the areas of training techniques, psychological and engineering aspects of training equipment, personnel requirements of new weapons systems, and the effects of environmental stress on human performance. This bibliography lists, by functional groupings, the 1,163 technical reports, technical notes, contractor reports, memorandum reports, and journal articles prepared by the laboratory and its contractors from April 1946 through December 1965.

TRAINING METHODOLOGY. PART 3: INSTRUCTIONAL METHODS AND TECHNIQUES. AN ANNOTATED BIBLIOGRAPHY. U.S.Department of Health, Education and Welfare, Washington, D.C. EDRS Order Number ED 031 628, price MF $0.50. Also available from the Superintendent of Documents, U.S.Government Printing

Office, Washington, D.C. 20402, price $1.00. Public Health Service Publication No. 1862, Part III. 109p. May 1969.

The revised annotated bibliography contains abstracts of 345 documents published between January 1960 and March 1968 on specific instructional methods and techniques for groups and individuals. Among methods included are: job instruction, apprenticeship, demonstration, coaching, internship, correspondence and independent study, programmed instruction and materials, lectures, group discussion, conferences, case method, role playing, simulation, and sensitivity training. A subject index is included.

III. PROGRAM DESCRIPTIONS

ORIENTING THE NEW EMPLOYEE WITH PROGRAMMED INSTRUCTION, RESULTS OF A TEST AT UNION ELECTRIC, ST. LOUIS. In TRAINING AND DEVELOPMENT JOURNAL; v2 n5 p18-22, May 1967. McClintock, Marion and others. 5p. May 1967.

A comparison was made of conventional orientation. The programmed instruction was found superior both in the quality of instruction and in the amount of teacher time and pupil time expended. Also the printing cost of programmed orientation was lower.

DEVELOPMENT AND EVALUATION OF A ONE-SEMESTER STENOGRAPHY COURSE. McMurtrie, Patsy B. San Francisco State College, California. EDRS Order Number ED 010 256, price MF $0.50, HC $5.60. 110p.

A study was undertaken to design a new scope and sequence for a shorthand and transcription course to fit a one-semester stenography program. A package of instructional materials, called a shorthand structured-learning program, was developed which included tapes, a textbook, film clips, and transparencies. Students in a high school and the state college took part in the program, as well as 12 students under an MDTA training program at an adult school. These 12 were from minority races, had various types of backgrounds, and little or no educational success. All students took a business English test before the course. An analysis of variance showed that they were from different populations. A final examination showed that all students attained essentially the same level of proficiency. The program took from 95 to 72 hours to complete. The generally accepted plan for teaching stenography involves 4 semesters. Thus it was concluded that this shorthand structured-learning program can reduce by half the time spent now in training stenographers and it presents a flexible program for average and talented students.

A COMPARISON OF A MASTER TEACHER AND INSTRUCTIONAL ASSISTANTS IN AUTOMATED SHORTHAND AND TYPEWRITING INSTRUCTION. FINAL REPORT. A PILOT STUDY CONDUCTED AT THE HARRISBURG AREA COMMUNITY COLLEGES. Ferencz, Dorothy. EDRS Order No. ED 026 518, price MF $0.50, HC $5.25. 103p. 31 July 1968.

The purpose of this study was to determine if there is a significant difference in the achievement of students in shorthand and typewriting classes taught by a master teacher using automated instruction as compared with the achievement of students using the same method and material with an instructional assistant supervising the classroom. This study was concerned with 33 girls enrolled in two sections of shorthand and 49 girls enrolled in two sections of typewriting at the post secondary level of the entire two school years of their program. The findings indicate that there is no significant difference between the performance of shorthand or typewriting students taught with automated instruction and professional personnel and those taught in the same manner utilizing instructional assistants. Therefore it was recommended that professional teachers' time should be spent in more creative work such as preparing the material for the classroom, planning methods, and procedures to be followed, and coordinating the work of the assistants, rather than supervising skill tech-

niques and proofreading papers which may be done as effectively by instructional assistants.

PILOT STUDY TO EXPLORE THE USE OF AN AUDIO-VISUAL TUTORIAL LABORATORY IN THE SECRETARIAL SKILLS AREA AS A MEANS OF UPDATING AND IMPROVING CURRICULUM OFFERINGS AT THE COMMUNITY COLLEGE LEVEL IN MICHIGAN. Edwards, Ronald K. and others. Lansing Community College, Michigan, Department of Accounting and Office Programs. EDRS Order No. Ed 027 387, price $0.25, HC $1.85. 35p. 1968.

This study dealt with two skill courses, business machines, and beginning typewriting. The control groups received instruction in the traditional method. The experimental groups attended open laboratory at any time convenient to them to receive their instruction. The groups were compared on the basis of identical performance tests. Materials to instruct the experimental group included 8mm film loops with sound tracks, slides with accompanying narration on magnetic tape, timed writings or production timings on magnetic tape, and hand-out sheets explaining any preparation necessary prior to the instruction. Differences between groups at the .05 level in both beginning typing and business machines indicate that the experimental groups did learn more as measured by the final performance test. Questionnaires indicated that students generally preferred the open laboratory method of learning over the traditional classroom method. Some of the recommendations were: (1) further research in an effort to build a completely individualized curriculum, (2) greater teacher availability by qualified teaching technicians, and (3) enrollment procedures allowing prospective students to begin a section at any time.

TRAINING TYPIST IN THE INDUSTRIAL ENVIRONMENT, AN EVALUATIONAL REPORT. Ball, Samuel. National Association of Manufacturers, New York. MIND Project. Available from the National Association of Manufacturers, 277 Park Avenue, New York, New York 10017. 13p.

The National Association of Manufacturers (NAM) held four typing laboratories in 1965 and 1966 at NAM headquarters (New York City), College Life Insurance Company (Indianapolis), Chemical Bank New York Trust Company (New York City), and Pacific Telephone and Telegraph Company (San Francisco) to develop a system of training typists within the industrial environment. Results showed that if the trainees wanted to learn to type and had a minimal educational level (could read and spell at above a sixth-grade level), they could be brought to an employable skill level in about 35 to 45 days at a very low training cost, since the MIND program is almost completely automated. If trainees were below sixth-grade level, they had to undergo a course in basic communication skills before beginning the typing program. Statistical data on the trainees including pre- and post-test results, improvement in speed and accuracy, number of days in the program, and employment or dropout information were tabulated.

TRAINING TYPISTS IN THE INDUSTRIAL ENVIRONMENT, PRELIMINARY REPORT OF A PROTOTYPE SYSTEM OF SIMULTANEOUS, MULTILEVEL, MULTIPHASIC AUDIO PROGRAMMING. Adams, Charles F. National Association of Manufacturers, N.Y. MIND

Monograph. Available from the National Association of Manufacturers, 277 Park Avenue, New York, New York 10017. 22p. 1 May 1966.

In 1965 ten Negro and Puerto Rican girls began clerical training in the National Association of Manufacturers (NAM) Typing Laboratory I (TEELAB-I), a pilot project to develop a system of training typists within the industrial environment. The initial system, an adaptation of Gregg audio materials to a machine technology, taught accuracy, speed building, job simulation, filing, spelling, and production work. TEELAB-I took the novice to over 40 words per minute in eight weeks and could be administered by any typist. Based on a ten-student class, the cost per trainee was $8.00 per week for leasing the equipment, typewriter rental, books, supplies, and administration time. In 1966, a tape-based system with a four- channel simultaneous playback of typing instruction on four skill levels was designed for use in TEELABS II and III, capable of FM radio broadcasts in which simultaneous four-channel transmissions could be made on sub-carriers while the station carried its regular program schedule. Such techniques could lead to cost reductions by making training available to large numbers of trainees.

A PILOT PROJECT IN PROGRAMMED LEARNING TO EXTEND THE PURPOSES AND INCREASE FACTORS OF MOTIVATION. Lanham, Frank W. and others. Michigan University, School of Education, Ann Arbor. EDRS Order Number ED 016 039, price MF $0.50, HC $3.68. 90p. October 1963.

The five-month study dealt with the application of three different programmed instructional lessons given in combinations to five different groups of 41 pupils each, selected at random from the cooperative, distributive and office occupations students at the High School of Commerce in Detroit. The study tested means of improving programmed instruction by adding motivation materials to increase the desire to learn, and by utilization of techniques for learning that would transfer to similar learning situations. The technical business vocabulary needed by cooperative work-study trainees was the subject matter used. Program A consisted of two programmed lessons to teach the technical vocabulary related to the commercial letter of credit. Program B was similar to A except that techniques of persuasion utilized in the field of advertising were inserted in the first lesson and incentives in the form of stories using realistic situations were inserted in the second. Program C had one lesson on how to learn technical vocabulary and a second on applying the how-to-learn technique. A 25-item multiple choice test was used for pre-, immediate post and retention testing. Although learning did result, there were no significant differences between or within treatment groups as to the amount of learning or retention which occurred.

PROGRAMMING WITHOUT PROOFREADING. Tydings, Kenneth S. In TRAINING IN BUSINESS AND INDUSTRY; v6 n7 p36-39 July 1969.

By putting training lessons on audiotape instead of in print, Metropolitan Life Insurance Company has been able to cut costs considerably.

INVENTORY SYSTEMS LABORATORY, FINAL REPORT. Naddor, Eliezer, Johns Hopkins University, Baltimore, Maryland. EDRS Order Number ED 026 849, price MF $0.75, HC $6.90. 136p. January 1968.

Four computer programs to aid students in understanding inventory systems, constructing mathematical inventory models, and developing optimal decision rules are presented. The program series allows a user to set input levels, simulates the behavior of major variables in inventory systems, and provides performance measures as output. Inventory Systems Lab (ISL)-1 deals with carrying, shortage and replenishment costs. The user selects three parameters: unit costs, interim demand, and planning horizon. He then must decide when and in what quantities replenishments are to be made. The program enables him to observe effects of changing parameters and/or replenishments on overall costs. ISL-2 and 3 introduce the user to factor optimization. For any reorder point and lot size set, interim system behavior and average costs are available. The user may then build a model for long-run system behavior, formulate optimization decision rules and have the program test his results. In ISL-4 a user faces a system with a variety of properties and policies including lost sales, prescribed variable demand, and fixed inventory policies for which he carries out model building and optimization exercises. The program series is considered flexible and effective as a heuristic aid.

PRICE, WATERHOUSE AIMS FOR 83% RETENTION WITH AV. In TRAINING IN BUSINESS AND INDUSTRY; v6 n4 p29-32, July 1969.

The Southern California Office of Price Waterhouse & Co. has launched an ambitious effort to impart more impact and meaning to the firm's continuing education program for professional staff by vastly expanding use of audio-visual techniques.

EDUCATIONAL APPLICATIONS OF MANAGEMENT GAMES, FINAL REPORT. Strother, G. B. and others. Wisconsin University, Madison, Wisconsin. EDRS Order Number ED 013 372, price MF $1.00, HC $13.00. 258p. August 1966.

The uses of management games for educational purposes were studied, and the methods used and results obtained were presented. Several investigations were undertaken and results reported--(1) A questionnaire survey and personal interviews indicated that management games were generally used to synthesize the student's previously acquired knowledge, (2) An attitude test and a fact and concept test were administered before and after the management games were played, and the results failed to show any statistically significant benefits from the game experience at either the undergraduate or graduate level, and (3) Observations of the subject's behavior in management game situations indicated to the author the importance of interpersonal relationships to the student's ability to learn from the game. The report also contains a complete description of a simple management game including structural equations computing procedure.

THE MANAGEMENT TRAINING GAME. Cooley, R.W. In THE TRAINING OFFICER; v4 n9 p10-13 September 1968.

The article is a description of the five year management training program at a private English concern (Turner and Newall, Ltd.) using programmed learning techniques.

A NOTE OF CAUTION ON LISTENING TRAINING, STUDY SHOWS POSSIBLE FALSE IMPRESSIONS AND OVEREVALUATION. In TRAINING AND DEVELOPMENT JOURNAL; v21 n5 p23-28 May 1967. Crawford, Harold E. 6p. May 1967.

Honeywell used an audio-programmed course in listening skills, consisting of a series of taped statements of varying lengths and complexity, with considerable noise, and the trainee made a written or oral response. It took two and one-half to three hours to complete plus an additional half hour for pre- and post-testing. The first group showed two-fold to three-fold increase in average scores. With another group of employees, the pre- and post-tests were reversed, and it was found that the average score at the end of the program was lower than at the beginning. It was concluded that the post-test was easier than the pre-test. Two persons at Honeywell took the pre-test and immediately the post-test (with no training) and showed better than a two-fold increase. A comparison of the tests showed that there were different numerical point values for correct responses. There was greater mathematical probability that the trainee would score better on the post-test. Adverse consequences of this include false impressions of amount of learning and an overevaluation of the course. Some improvement was achieved by the training but caution is urged in selecting training programs for listening skills.

A DEVELOPMENTAL STUDY OF MEDICAL TRAINING SIMULATORS FOR ANESTHESIOLOGISTS. FINAL REPORT. Abrahamson, Stephen and Denson, Judson. University of Southern California, Los Angeles. EDRS Order No. ED 019 253 price MF $1.00, HC $10.90. 216p. 31 January 1968.

In this study, a computer-controlled patient simulator (Sim One) was designed, constructed, and tested for the training of anesthesiology residents at the University of Southern California School of Medicine. The training involved the development of skill in endotracheal intubation. The experiment involved 10 anesthesiology residents. Five were given training on the patient simulator while the other five were introduced to their residency in the usual manner. Comparisons between simulator-trained residents and those in the control group were made on the basis of elapsed time from date of arrival in the program to date of performance at a professional level of proficiency. The official anesthesia charts of the hospital were used as the source of data. The results indicate that there is a time advantage to the use of such a simulator in training in the skill of endotracheal intubation. The time advantage demonstrated is two-fold in that (1) residents achieve proficiency levels in a smaller number of elapsed days of training, and (2) residents achieve a proficiency level in a smaller number of trials in the operating room.

A TRAINING PROGRAM ON MANAGEMENT DEVELOPMENT FOR HEALTH AGENCY PERSONNEL. Pennsylvania State University, University Park. Available from Continuing Education, Pennsylvania State University, University Park, Pennsylvania 16802. 25p. Devember 1968.

The purpose of this workshop was to take research data and information generated from conference discussion and use it to initiate or improve management development programs in the health service field. Participants in the group included hospital administrators, personnel directors, and other hospital officials, and representatives of the hospital associations of Pennsylvania, New Jersey, and New York. Obstacles to, and opportunities for, management development programs in hospitals were discussed and new developments in educational technology and in educational media were presented.

COMMUNICATION OF WORK METHODS. KANSAS STATE UNIVERSITY, MANHATTAN, ENGINEERING EXPERIMENT STATION. Konz, Stephan A. and others. EDRS Order No. ED 016 054, price MF $0.25, HC $2.20. 42p. June 1964.

The economic implications of programmed instruction for work training under controlled conditions were investigated. "Work training" required the memorization of procedures during the training period. One experiment utilized 20 unskilled females who completed a layered assembly by referring to a typed list or slides of the assembly which were operator paced. With criteria of time and errors, the slides were more effective. A second experiment utilized 20 male college students who made a layered assembly by referring to a typed list on a slide or slides of the assembly, again operator paced. The assembly slides were more effective than the list slides. A third experiment utilized 16 unskilled females who made a layered assembly by referring to multiple slides per layer, single slides per layer, a typed list in a typewriter, or taped audio instructions. All were operator paced. Both slide methods were about equally effective, and both were more effective than the list or audio methods. A fourth experiment utilized 10 male college students who made a layered assembly by following a typed list with the fingertip of the left hand, or using one slide per layer. The slides were more effective. A fifth experiment utilized 12 male college students who made a simulated electrical terminal board by referring to a typed list, colored slides of the assembly, or audio tape recording. Errors increased from slides to list to tape. In all experiments, pictorial presentation was best for both the time and error criteria.

PROGRAMMED INSTRUCTION IN THE PLANT. Stuart, William L. In TRAINING AND DEVELOPMENT JOURNAL; v23 n8 p42-47. August 1969.

A device called the AutoTutor has been used successfully since 1964 by the American Can Company in teaching a programmed course on shop mathematics and blueprint reading. In trials of the AutoTutor, average scores rose from 71% to 96% and from 61.5% to 86.1%. Trainees are taught the subject matter by a combination of linear and branching techniques, tested on retention as they progress through the course, and given a final examination. Learning time now varies from under 58 hours to under 14 hours, with an average time of less than 25 hours, as opposed to 216 hours for the old course. Annual net savings of $83,500 are being realized for this single course. A programmed course in forklift truck operation has recently been added.

WORK INSTRUCTION PROGRAMS FOR THE FOOD SERVICE INDUSTRY. Konz, Stephan A. and Middleton, Raymona. Kansas State University, Manhattan. Agr. and Appl. Sci. EDRS Order Number ED 011 961, price MF $0.09, HC $2.75. 53p. April 1967.

A project was initiated to develop efficient work methods for 100 common tasks in the Food Service Industry and then to prepare programmed learning "packages" for each of these tasks for training potential employees and employees with lower levels of education to hold useful jobs. The concept of programmed learning packages for food servicing was demonstrated to be effective in preliminary field tryouts. Each package consisted of a set of slides, combining photos and captions, that depicted a series of programmed steps organized to teach a single food preparation task. Audio tapes were included in the original plan but were discarded when experiments showed they contributed little to task learning. The tasks covered by the programmed slides were dipped salad assembly, cleaning a meat slicer, making salad sandwiches, making sliced meat sandwiches, making change, breading foods for deep-fat frying, frosting a cake, cutting a cake, portioning pudding, and cutting a pie. Only these ten programmed lessons were completed when the project was cancelled because of a lack of funds.

RETRAINING BY PRIVATE INDUSTRY. Ida R. Hoos. In RETRAINING THE WORK FORCE, AN ANALYSIS OF CURRENT EXPERIENCE, University of California Press, 1967, p73-101. 29p. 1967.

Several San Francisco Bay area companies were examined for specific programs for displaced employees. Armour and Co. sought to guide displaced employees to classes or courses of action outside its own sphere of operation. Lockheed has provided unusually well for upgrading and retraining, mainly because of industry fluctuations and rapid technological change, American Can Company offered journeymen a combination of on-the-job training and junior college courses. The Western Die Casting Co. focused on improved quality control. By means of a tracer lathe operators' program, Kaiser Aerospace Corp. partly succeeded in reducing turnover. Findings show that (1) industry develops few training programs except during labor shortages, (2) displacees may not be needed, or else low skills make salvage impossible, (3) programs often fail to meat anticipated skill changes because of poor communication within the organization, and (4) values of training emerge despite labor conditions.

TRAINING OF OLDER WORKERS--ENGLISH AND WEST EUROPEAN EXPERIENCE. Belbin, Meredith. In Proceedings of the National Conference on Manpower Training and the Older Worker, Washington, January 17-19, 1966. p31-42. EDRS Order Number ED 017 784, price MF $0.25, HC $.75. 13p. January 1966.

The role of the Organization for Economic Cooperation and Development is illustrated in reports of varied retraining programs (part of the Active Manpower Policy) in Great Britain, France, and Sweden. The programs include such activities as --(1) financial encouragement of industry to participate in training the older adults, (2) retraining to meet specific shortages in the work force, (3) training for future industrial needs, and (4) provision of training allowances. Scientific research done in England has provided evidence that it is sound public policy to invest in training of

older persons, and specially-designed training for them is very effective. The results of two studies demonstrate an activity method of learning is superior to memorization, and when inference, or deduction, is introduced into programmed and activity learning, success is greater than by either method, as well as by memorization. A high dropout rate at commencement of training and after transfer to the work situation, and low employment in larger, more advanced firms were also revealed by the surveys. Information resulting from these studies is being applied in experimental projects in five countries.

PROGRAMMED INSTRUCTION IN ACTION. Stavert, G. S. In BACIE JOURNAL; v23 n1 p16-20 March 1969.

The Royal British Navy has been evaluating the effectiveness of programmed instruction in Service courses. In small scale progam (nine hours) at HMS St. Vincent, recruits studying trigonometry used AutoTutor teaching machines, or scrambled textbooks, or conventional methods. The teaching machine group scored higher marks and finished first. At HMS Collingwood, machines were tried out with longer programs (one month each) on basic electricity and electronics; the course included machine study and practical work with minimum assistance from the instructor. Initial results did not confirm the HMS St. Vincent findings. A change was made to provide an active role for the instructor; the day was broken down into auto-instruction, tutorials, laboratory work, and other activities. The program has produced results as good as, better than, and worse than the conventional method; what really works is the system. The benefit at HMS Collingwood was that the number of instructional staff was cut by half. At the submarine school HMS Dolphin, programmed instruction was used, not to effect staff economies but to solve an instructional problem--recognition of underwater sounds. This course is producing results in some cases twice as effective as the old method.

TECHNOLOGICAL CHANGE AND THE JOURNEYMAN ELECTRICIAN. AN EXPERIMENTAL STUDY IN CONTINUING EDUCATION. VOLUME 1. Bushnell, David S. Stanford Research Institute, Menlo Park, California. EDRS Order No. ED 017 671, price, MF $0.75, HC $6.65. 131p. March 1963.

The objective of this study was to identify those factors which facilitate or hinder the effective training of journeyman electricians and to evaluate the effectiveness of new teaching aids in training them, in holding their interest in voluntary training programs, and in leading them to enroll in future training courses. All journeyman electricians who were members of local 617, International Brotherhood of Electrical Workers, in San Mateo County, California, were surveyed by mailed questionnaires to determine their attitudes toward training and their training needs. The experimental design consisted of teaching the course "Introduction to Industrial Electronics" to a group of 96 journeymen inside wiremen by three modes of instruction. The instructional modes were (1) self-paced individualized instruction using a branching type electrically operated teaching machine with a highly qualified journeyman electrician who had no previous teaching experience as

a monitor, (2) self-paced individualized instruction with an opportunity to discuss previous material and outside readings with an experienced instructor, and (3) the conventional classroom arrangement. Each mode was made up of two classes which met for three hours once a week for nine weeks. The modes were designed to follow the same sequence of instructional information to contrast instructional procedures, not content. Pre- and post-achievement tests were used to measure the degree of learning. Some conclusions based on data analysis were (1) auto-instruction worked as well as conventional instruction, (2) Auto-instruction with live instruction yielded higher student satisfaction, and (3) the unique problems of adult education require instructors familiar with and capable of teaching adults.

MODULAR AUDIO-VISUAL MULTIMEDIA PROGRAMMING CONCEPT; ELECTRONIC BLUEPRINT READING. STUDY REPORT 1. Suchesk, Arthur M. EDRS Order No. ED 023 298, price MF $0.25, HC $1.65. 31p. [1965].

The concept of Modular Audiovisual Multimedia Programming, which is generally applicable to meeting the need for automated mass training, has been implemented in an electronic blueprint reading course for industrial employees. A preliminary study revealed that the average prospective student was 25 to 35 years old, limited to a high school education, and insufficiently skilled in electronic symbols and recognition and locating information on blueprints. The material to be learned was organized in nine instructional modules, then presented through several media. A total of 196 color slides was accompanied by commentary on magnetic tape, and each student was supplied with a kit of support materials, including programmed instruction and self-evaluation exercises. The course was found suitable for use in the work area and was then self-administered by groups of from one to twenty individuals. Instructional time averaged about six hours, but the total time involved depended on speed of preparation and the number of sessions used to study the nine modules. Comparison of initial and final test scores indicated a significant transference of the desired skills. Management personnel and most of the students expressed satisfaction with the structure, content, and effectiveness of the course.

COMPARISON OF THREE MODES OF INSTRUCTION FOR THE OPERATION OF A COMPLEX OSCILLOSCOPE. Folley, John D. and others. Applied Science Associates, Inc., Valencia, Penna. Clearinghouse for Federal Scientific and Technical Information, Order Number AD-654-004, price MF $0.65, HC $3.00. 71p. March 1967.

A field experiment was conducted to compare the effectiveness of three modes of instruction in the use of the AF 180 oscilloscope (Tektronix 545A). Skilled electronic technicians of the U.S. Air Force Security Service served as subjects. One group was trained with an audiovisual instructional program, and a second group with a book form of the same program. The program combined verbal instruction and responses with practice on an oscilloscope. A third group was trained in the traditional manner in a laboratory. Analysis of variance on test scores indicated superiority of both forms of the program over the conventional instructions with no difference in effectiveness between programs. Electronic aptitude, as measured by the Airman Qualifying Examination (AQE), correlated significantly with test scores for the conventionally trained group and for all subjects together.

HOROLOGICAL AND MICRO-PRECISION PROJECT. FINAL REPORT. Dobrovolny, Jerry S. and others. Illinois University, Urbana. EDRS Order No. ED 022 927, price MF $1.00, HC $13.10. 260p. January 1968.

The purposes of the project were (1) to establish better methods of training technicians for the horological and industrial fields, (2) to encourage more people to investigate horological and micro-precision work as a career, (3) to train a group of students who would be employable in diverse horological and industrial areas, and (4) to help horological schools in their training programs through the benefits of this research and demonstration project. The first period of 5 months was spent in curriculum planning, preparation of class materials, and in equipping the horology laboratory, while the second period of 7 months was used to train a group of students in horological and micro-precision skills. Essentials of preparing and conducting a course in horology and micro-precision technology and a chronological record of the horological and micro-precision laboratory sessions are given to provide information on this first attempt to formulate a course in horology and micro-precision training. Some of the materials generated from the project include: (1) course outlines for horology laboratory and related subjects, (2) a proposed certificate horological curriculum and as associate degree micro-precision curriculum, (3) a disassembly and assembly procedure programmed instruction booklet, (4) a detached lever escapement function and adjustment booklet, and (5) chronograph illustrations.

MIND, INC. SYSTEM APPROACH TO TRAINING HARD-CORE UNEMPLOYABLES. Kline, Bennett E. In TRAINING DEVELOPMENT JOURNAL; v23 n9 p18-21 September 1969.

MIND, INC. (Methods of Intellectual development), an organization specializing in manpower development, uses magnetic tape operated IBM composing equipment to speed the preparation and updating of academic, vocational, and personal development course materials for hard-core unemployables of varying educational backgrounds. Programs are written by the Design Division, and materials are prepared within the Editorial Production Group. Savings in both time and cost have been significant.

TEACHING MACHINE STUDY. FINAL REPORT. EVCO, ALBUQUERQUE, NEW MEXICO. REPORT NUMBER OEO-1290. EDRS Order No. ED 019 004, price MF $0.25, HC $2.20. 42p. 13 January 1967.

In an investigation of the potential of teaching machines in the Job Corps mathematics program, existing Job Corps arithmetic material was prepared for instruction by machine and programmed text, and then field tested. Revisions were made, and a programmed manual for instructors written, after which a new field test was run. In the initial field test, the teaching machines were greatly preferred to the programmed text and showed slightly higher achievement gains. Improvements preceding the second field test included a revision of the text, improvement of the administrative aspects of the system, addition of remedial tutoring, and development of a new type of student response format for programmed texts. This new format gave immediate peek-proof student feedback, immediate diagnostic feedback to the instructor, and could be used directly as input data for item analysis. The second field test showed the learner-oriented programmed

text to be more effective than the teaching machines available. No compelling data suggested the wide-spread adoption of these machines in conservation centers.

EXPERIMENTAL AND DEMONSTRATION MANPOWER PROJECT FOR TRAINING AND PLACEMENT OF YOUTHFUL INMATES OF DRAPER CORRECTIONAL CENTER AT ELMORE, ALABAMA. FIFTH PROGRESS REPORT, MAY 1 - JULY 1, 1965. McKee, John M. and Seay, Donna M. Draper Correctional Center, Elmore, Alabama. EDRS Order Number ED 020 308, price MF $0.50, HC $5.45. 107p. 1 July 1965.

Inmates were experimental subjects in a project for vocational training and placement. Of the 46 who completed training in May, 35 were paroled and employed, and 11 were awaiting parole confirmations. A second group were enrolled to overcome some student weaknesses. A remedial night school class was initiated. This problem could be eliminated by raising the upper age limit from 21 years to make more qualified students available for selection. Plans for a coordinated pre-release program were being made to allow inmates the opportunity of interviewing for jobs outside the center prior to parole. A tentative follow-up program was established. Plans for field testing the developed program were completed. The board of directors were to review a proposal for developing demonstration vocational programs for the disadvantaged which would utilize mathematical programs and audiovisuals synchronized for computerized instruction. Socioeconomic information on the new trainees is presented.

PROGRAMMING THE ABILITY TO RECOGNIZE COMPLEX "MEANINGFUL" NOISES. In ASPECTS OF EDUCATIONAL TECHNOLOGY. Proceedings of the Programmed Learning Conference, Loughborough, England. April 15-18, 1966, pp 359-367. Gardner, Arthur. Available from Methuen & Co., Ltd., 11 New Petter Lane, London EC4, England. 11p. 1967.

A description is given of the programming techniques being developed by Applied Psychology Unit (Admiralty Research Laboratory) to train sailors for a complex audio-perceptual task. Attention is drawn to a departure from classical ideals of programming.

PROGRAMMED INSTRUCTION IN THE ROYAL NAVAL ELECTRICAL SCHOOL. In ASPECTS OF EDUCATIONAL TECHNOLOGY. Proceedings of the Programmed Learning Conference, Loughborough, England, April 15-18, 1966, pp 167-179. Stavert, G. S. Available from Methuen & Co., Ltd. 11 New Petter Lane, London EC 4, England. 15p. 1967.

This paper outlines the way in which programmed instruction is fitted in with conventional classroom instruction and practical laboratory work in an integrated training scheme in the Royal Naval Electrical School. The role of the live isntructor is emphasized. The benefits, and also possible disadvantages, of the scheme are suggested.

IV. RESEARCH AND EVALUATION

PSYCHOLOGICAL RESEARCH IN ADULT LEARNING. Dubois, Philip H., Ed. Washington University, Department of Psychology, St. Louis, Missouri. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-672-748, price MF $0.65, HC $3.00. 71p. 1968.

This report includes a number of papers centered around educational technology which were presented at a conference at the Bromwoods Residential Center of Washington University. Topics were the systems approach to learning, computer assisted instruction, the role of simulation in training, programmed instruction, educational technology in technical training, the learning of operational equipment as a criterion in training research, and the evaluation of a partially self-paced course.

PSYCHOLOGICAL RESEARCH IN CLASSROOM LEARNING. Report on a Conference at the Bromwoods Residential Center, Washington University, St. Louis, Missouri. Wientge, King M., Editor and others. EDRS Order No. ED 017 793, price MF $0.50, HC $6.40. 126p. 1967.

Papers were presented at a conference on classroom learning on such topics as program design, testing and other evaluation techniques, computer assisted instruction, programmed instruction, simulation, pacing, and retention. Several treated military training, adult learning, and adult-centered classroom techniques. In one paper, the systems approach to adult learning was predicated on the application of engineering logic in formulating objectives, identifying and allocating functions, and planning for operation of the system and system testing. Another study compared the performance of Navy trainees in radar and radar navigation technology as measured at four points in the training sequence. One retention study compared programmed and conventional instruction in a Navy technical course. Attitudes of instructors, training administrators, and Navy and Marine enlisted men toward programmed instruction were surveyed at eight aviation technical training schools.

COMPARISON OF CONVENTIONAL AND PROGRAMMED INSTRUCTION IN TEACHING COMMUNICATIONS PROCEDURES. Johnson, Kirk A. and others. U.S.Naval Personnel Research Activity, San Diego, California. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-656-894, price MF $0.65, HC $3.00. 22p. May 1967.

In this study, the third in a series evaluating programmed and conventional instruction in the schools of the Naval Air Technical Training Command, a comparison was made between two versions of the Airborne Radio Code Operator (ARCO) course. In the conventional version, military communications procedures were taught by means of lecture discussion sessions. In the other version, this same material was taught by means of programmed

booklets. The students in the program version required a total of 14.5 hours to cover the material, as opposed to a total of 30 hours for the lecture discussion sessions. This afforded a savings of better than 50 percent over this particular part of the course and a savings of two days in the total length of the course. Mastery of the materials was measured by two special tests. On the multiple choice test, the conventional group was found to be slightly better than the program group. On the short answer test, the program group was found to be slightly better than the conventional group. The difference favoring the program group was somewhat larger than that favoring the other group.

COMPUTER ADMINISTERED INSTRUCTION VERSUS TRADITIONALLY ADMINISTERED INSTRUCTION, ECONOMICS. Kopstein, Felix F. and Seidel, Robert J. George. Washington University, Washington, D.C. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-656-613, price MF $0.65, HC $3.00. 43p. June 1967.

An attempt is made to assess the economics of computer assisted instruction (CAI) versus traditionally administered instruction (TAI) in controlling the structure of the learner's stimulus environment in teaching and training situations. There is a discussion of the need for a sound, objective economic appraisal of the value to society of increments in the breadth and depth of education in the population, and of the influence of varying rates at which these increments are brought about. The necessity for reliable, objective information concerning cost data is emphasized. Projected comparisons of cost and effectiveness based on the assumption of equal effectiveness for CAI and TAI are discussed for civilian and military instruction. In particular, the five studies of military technical training stress costs per student hour, and illustrate the problem of obtaining accurate cost figures for military instructional expenditures.

EVALUATION OF AN INDIVIDUALLY PACED COURSE FOR AIRBORNE RADIO CODE OPERATORS. Final Report. Johnson, Kirk A. and Baldwin, Robert O. U.S. Naval Personnel Research Activity, San Diego, California. U.S.Navy, Washington, Chief of Naval Personnel. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-661-859, price MF $0.65, HC $3.00. 22p. August 1967.

In this study comparisons were made between an individually paced version of the Airborne Radio Code Operator (ARCO) course and two versions of the course in which the students progressed at a fixed pace. The ARCO course is a Class C School in which the student learns to send and receive military messages using the International Morse Code. The individual pacing was achieved through the use of programmed instruction booklets and audio tapes. One of the fixed pace versions was the conventional course in which the programmed booklets were not used. The other was a course in which the instructional materials were exactly the same as those used in the individually paced version. The individually paced course required 16 percent less time than the conventional course and nine percent less time than the fixed

pace course in which the programmed booklets were used. These reductions in course length were purchased at the cost of small, unreliable losses in the final average--1.44 and.75 points respectively. There were some indications that this evaluation might have provided a somewhat conservative estimate of the gains that can be realized through the use of individual pacing.

COMPARISON OF CONVENTIONAL AND PROGRAMMED INSTRUCTION IN TEACHING AVIONICS FUNDAMENTALS. Longo, Alexander A. and Mayo, G. Douglas. U.S. Naval Personnel Research Activity, San Diego, California. EDRS Order No. ED 014 679, price MF $0.25, HC $2.10. 40p. December 1965.

This study, part of a series involving a variety of course content and training conditions, compared programmed instruction with conventional instruction to gain information about the general utility of programmed methods. The performance of 200 Navy trainees taking 26 hours of conventional instruction in electrical calculations, direct current circuits, and direct current meters was compared with that of 200 trainees taking 19 hours of programmed instruction on the same content. Results indicated the following-- (1) the basic electronics students learned a relatively large block of programmed material to about the same degree but in much less time than was required by conventional instruction--(2) the constructed response examination, prepared for programmed instruction purposes, was satisfactorily reliable--(3) the conventional and programmed instruction groups did not differ significantly in performance -- (4) the "90/90 performance level" of programmed material decreased as a function of the amount of material tested at a given time.

TWO TRACK TRAINING FOR AVIONICS FUNDAMENTALS. FINAL REPORT. Johnson, Kirk A. and Salop, Phyllis A. United States Naval Personnel Research Activity, San Diego, Calif. Clearinghouse for Federal Scientific and Technical Information. Order No. AD-678-348, price MF $0.65, HC $3.00. 41p. September 1968.

An experimental twotrack training system, developed for use in the Avionics Fundamentals course, was evaluated against the conventional one track system The conventional course lasted 16 weeks. The two track system consisted of a regular track identical to the conventional course, and an accelerated track lasting ten weeks. Students were graded on a scale with a maximum of 99, and "average" of 75, and a minimum passing grade of 63. Students in the two track system made grades roughly one point lower than those of students in the one track system. This difference became about half a point in subsequent courses. The two track system reduced training time by 1.38 weeks per student (about 181 student man years per year).

AUTOMATION OF A PORTION OF NCC LEADERSHIP PREPARATION TRAINING. Showel, Morris and others. George Washington University, Washington, D.C. 24p. December 1966.

A method of presenting roughly one-seventh of the Army's two-week Leader Preparation Course (LPC) through automated instruction was developed. The automated instruction method included the use of tape-recorded lectures, supported by visual aid frames, and programmed workbooks. Automated presentation proved to be at least as effective as conventional instruction in imparting the leadership knowledge covered by automation. In addition, those students who learned through the automated method appeared to retain their knowledge better than the conventionally-trained students. The automated method also exhibited practicality in reduction of instructor requirements, flexibility of scheduling, and consistency of level of presentation. The automated program was adopted for use at Army Training Centers presenting the LPC.

HOW EFFECTIVE IS PROGRAMMED INSTRUCTION IN TEACHING OF READING? Fry, Edward. Paper presented at International Reading Association Conference, Boston, Mass., April 24-27, 1968. EDRS Order No. ED 026 219, price MF $0.25, HC $1.60. 30p.

The history and general principles of programmed instruction are surveyed. Research literature published on the topic is cited and the declining frequency of articles appearing on the subject is noted. Some reasons for the growing use of programmed instruction in industry are discussed. A plea for better evaluation measures is made. The use of programmed instruction as a teacher aid and as a means of individualized instruction is affirmed. References, data tables, and sample programmed frames are included.

EVALUATING THE EFFICIENCY AND EFFECTIVENESS OF SELF-INSTRUCTIONAL METHODS FOR SELECTED AREAS OF VOCATIONAL EDUCATION. FINAL REPORT. Coffey, John L. and others. Battelle Memorial Institute, Columbus, Ohio. EDRS Order No. ED 019 511, price MF $1.00, HC $11.00. 218p. February 1968.

The two major phases of this research were: (1) analyzing trade and industrial education to identify and describe primary vocational skills, and (2) developing and evaluating nine self-instructional units. Three instruments were used in analyzing vocational content sources to identify and describe general behaviors as well as trade-specific examples of how the behaviors are demonstrated within automotive mechanics, cosmetology, drafting, electrical-electronics, machine trades, sheet metal, and welding. The major result of the analysis phase was the development of a behavioral catalog containing the general behaviors involved in trade and industrial education and specific examples of how these behaviors are demonstrated. Evaluation supported the contention that self-instruction is efficient and effective.

ICAF-TEMPER 66, STUDENT ACCEPTANCE OF A COMPUTER SIMULATION OF INTERNATIONAL RELATIONS AS AN ADJUNCT TO THE CURRICULUM OF THE INDUSTRIAL COLLEGE OF THE ARMED FORCES. Hodgson, James B., Jr. Operations Res. Systems Engineering, Washington, D. C. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-642-782, price MF$0.65, HC $3.00. 30p. 12 September 1966.

TEMPER 66 was a computer simulation exercise in economic, military, political, and diplomatic decision making at the national level introduced into the Industrial College of the Armed Forces as a capping experience for the student body. A 29 item questionnaire administered after the play was analyzed in the light of characteristics of the model to probe student reactions. Response was enthusiastic on the part of the students (military officers, most with college degrees, many with technical or related backgrounds), but with reservations about TEMPER. It is recommended that there be no further development of the model for ICAF purposes because of the wide divergence of the model from reality and its lack of verifiability, but that the exercise be continued in its present form to illustrate the acquisition and use of simulation systems rather than to teach the substance of the simulation.

A COMPARISON OF RESPONSE CONFIRMATION TECHNIQUES FOR AN ADJUNCTIVE SELF-STUDY PROGRAM. Meyer, Donald E. Aerospace Medical Research Labs, Wright-Patterson AFB, Ohio. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-640-503, price MF $0.65, HC $3.00. 30p. June 1966.

An experiment compared the effectiveness of four methods of confirming responses to an adjunctive self-study program. The program was designed for Air Force aircrews undertaking a refresher course in engineering. A series of sequenced multiple choice questions each referred to a page and paragraph of a publication containing detailed information on the questions. If a response was correct the student continued to the next question. If a response was incorrect he referred to the publication. The methods of response confirmation were (1) chemically impregnated inks which changed color when moistened with a wetting agent, (2) punchboards, (3) opaque erasable overlays, and (4) a machine with a lighting and buzzing system. No significant differences in learning were found as a result of these methods, nor were there notable differences between group opinions about the methods used. On this basis, the selection of a response confirmation mode for an adjunct program may be based upon cost and availability of equipment and materials.

AN EXPERIMENTAL PROGRAM FOR RELATING TRANSFER OF TRAINING TO PILOT PERFORMANCE. Demaree, Robert G. and others. Life Sciences, Inc., Fort Worth, Texas. U.S.Naval Training Device Center, Port Washington, New York. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-471-806, price MF $0.65, HC $3.00. 78p. June 1965.

The UDOFTT (Universal Digital Operational Flight Training Tool), programmed to simulate a high performance single engine jet fighter, was used for an initial study of specific pilot trainer characteristics and the corresponding training effectiveness. Six maneuvers were employed in conjunction with real time simulation of in-flight piloting tasks in an F-100A cockpit. Results of the study and of earlier investigations of the UDOFTT provided a basis for planning a series of pilot training experiments. Methodology, rationale, and design of these experiments were oriented toward effective use of the UDOFTT to determine the extent to which reductions in the degree of simulation affect pilot performance and the amount of transfer of training.

INDIVIDUAL AND SMALL-UNIT TRAINING FOR COMBAT OPERATIONS. Papers presented at the 12th Annual Conference of the United States Army Human Factors Research and Development, Fort Benning, Georgia, October 1966. Jacobs, T. O. and others. George Washington University, Washington, D.C. Clearinghouse for Federal Scientific and Technical Information, Order No. AD-653-845, price MF $0.65, HC $3.00. 61p.

Research in the area of military training and training methods was reviewed and assessed for (1) its relevance to modern combat operations (identification of combat tasks, development of skill training, and evaluation) and (2) its efficiency (reduced cost and time and increased trainee proficiency, or both). Cases of effective research in use of weapons (Trainfire and Rifleman Series), land navigation, and operation as squad member and leader were cited. Progressive steps were established for training improvement and included such activities as: analysis of training objectives, literature and psychological learning factors, and determination of essential subjects, skills, and performances. Improved programs resulted in elimination of lectures, more individualized instruction, appropriate placement of instruction, and realization of the importance of group practice and feedback. After detailed reports, the conclusion was reached that learning effectiveness depended upon attainment of realistic training objectives and type of media was determined by economic feasibility.

THE EFFECT OF PROGRAMMED INSTRUCTION RESPONSE CONDITIONS ON ACQUISITION AND RETENTION. McCrystal, Thomas J. and Jacobs, T. O. George Washington University, Washington, D.C. Clearinghouse for Federal Scientific and Technical Information Order No. AD-646-347, price MF $0.65, HC $3.00. 45p. December 1966.

A study was made of the effectiveness of programmed instruction, with or without student response, under either constructed or prompted conditions, with military training as the content. One hundred twenty infantry lieutenants, in groups of 30, used the programmed instruction with four response modes--constructed overt, constructed covert, prompted overt, and prompted covert. Tests of achievement were administered immediately, and repeated to test retention after ten or twelve days. Two control groups were also tested, one having no instruction, and the other with conventional lecture instruction. Attitude questionnaires were administered at once and after seven or eight weeks. Although all experimental groups scored higher than the conventionally trained group, differences were not significant statistically. However, the programmed instruction required only about 60 percent as much time, when no response was required. The similarity in effectiveness of different response modes suggested that, for content of this nature and length, constructed responses could be dispensed with in favor of prompted covert responses. Students indicated a favorable attitude toward programmed instruction immediately after finishing it, but this favorable attitude became less positive in all groups during the seven-week period of conventional instruction afterward.

TRAINING TIME AND PROGRAMED INSTRUCTION. In JOURNAL OF APPLIED PSYCHOLOGY; v50 n1 p1-4, February 1966. Mayo, George D. and Longo, Alexander A. 6p. February 1966.

A study was made of programmed instruction as a means of reducing training time without loss of quality. A pretest divided 226 Navy and Marine personnel into two groups, who attended an aviations electronics fundamentals course. Thirteen of 40 hours of material, normally taught by conventional methods, was presented in programmed form to one group. Both groups were administered two tests following training--the conventional test previously written and item-analyzed by the school, and one constructed in the early stages of programming procedures. The results have been tabulated and support the hypothesis that programmed instruction, when used in similar learning situations as in this study, has the potential for reducing the training cost through reduction of training time.

AN INVESTIGATION OF THE EFFECTIVENESS OF TRAINING DEVICES WITH VARYING DEGREES OF FIDELITY . Grunwald, Walter. Oklahoma University, Norman. University Microfilms Order No. 68-13,559, price MF $3.00, Xerography $8.00. Ph.D.Thesis. 173p. 1968.

A study was made of the relative effectiveness of five selected training devices with varying degrees of fidelity in the learning of a psychomotor task in which manipulative skill was not vital. The hypothesis was this: an increase in fidelity may not produce a corresponding increase in effectiveness, whereas such factors as ability to engage a learner in meaningful physical and mental interaction may be more important than mere resemblance to the real equipment. Five homogeneous groups of Air Force students were randomly assigned to training with either the actual equipment, a functional simulator device, a partly functional mock-up, a full-sized photograph, and a small illustration of the equipment. All groups received identical instruction through a programmed text and a tape recording. Training devices were evaluated on transfer of training as expressed by scores on written and performance tests. Results significantly favored the partly functional mock-up and suggested that the effectiveness of training devices may decrease when fidelity is increased beyond a certain optimum value. A model of this relationship was developed.

A STUDY OF COMPUTER-ASSISTED INSTRUCTION IN INDUSTRIAL TRAINING. Schwartz, H. A. and Haskell, J., Jr. In JOURNAL OF APPLIED PSYCHOLOGY; v50 n5 p360-363. 4p. 1966.

The study was undertaken to test the feasibility of remote computer-assisted instruction as an industrial training technique. Seventy-nine newly hired electronic technicians received their required training in basic data processing principles through programmed texts, the standard method used for this presentation. Twenty-five equivalent students received the same training through a keyboard-operated terminal device linked remotely to an IBM 1440 computer system. No significant differences in examination scores were obtained; however, there was a significant saving (approximately 10%) in the time required to complete the course. On an attitude questionnaire administered subsequent to the courses, both groups rated their respective method of instruction as approximately equal to regular classroom techniques in terms of effectiveness and desirability.

CAN OPERATIVE TRAINING BE AUTOMATED? Cox, T. W. In INDUSTRIAL TRAINING INTER-

NATIONAL; v4 n1 p14-18 January 1969.

When weakness appeared in the conventional method of training process operators, through demonstrations and practice of tasks, at W. D. and H. O. Wills, a research project was started in 1966 into the use of programmed instruction linked with short demonstration films. From the research was developed a branching program with remedial sub-routes, color film, a book of method sheets in cartoon fashion with a minimum of words, a book of detailed and very clear drawings for reference, and an instructor's handbook. The whole program is controlled by an instructor who validates the training. He helps by further teaching and interpretation only if the trainee asks for clarification. This results in a high degree of involvement by the trainee with the program. The program has been tried in three of the Wills training schools and the trainees have passed the standard post training competence test at a higher level than those trained by the conventional method.

AN ASSESSMENT OF RESEARCH RELEVANT TO PILOT TRAINING. Smode, Alfred F. and others. Aerospace Medical Research Labs. Wright-Patterson AFB, Ohio. Available from the Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio. 225p. November 1966.

This report presents a critical review and interpretation of the considerable amount of research data that have either direct or indirect implications for the training of pilots. The purpose is to organize systematically the research findings from the human performance and the training research literature that are pertinent to pilot training and, based on the status of research in defined areas, to identify researchable issues. Successive portions of the report deal with studies on the definition of the pilot's job, the acquisition of flying skills, performance measurement, simulation and transfer of training, operational components of the pilot's job and the maintenance of flying proficiency. Attention is also given to studies concerned with improving training systems, and recent innovations in training methods are reviewed. As it provides much information directly concerned with pilot training, This report will interest those involved in any aspect of flight training.

THE AIR FORCE-OAR CONTRIBUTION TO PROGRAMMED INSTRUCTION. Martorana, S. V. U.S.Office of Aerospace Research, Air Force, Washington, D. C. Clearinghouse for Federal Scientific & Technical Information. Order No. AD-607-073, price MF $0.50, HC $1.00. August 1964.

The paper describes the results of a brief examination of documents and reports related to Air Force activities in programmed instruction and the influence this new educational method is having on instructional and training programs, both in military and civilian fields. The documents on which it draws are those available in the files of the Division of Life Sciences and Mathematical Sciences, DSC Plans and Programs, HQ Office of Aerospace Research (OAR) and in The Directorate of Life Sciences, Air Force Office of Scientific Research, OAR. The purpose of this inquiry was to identify the ways that Air Force interest in and support of research in the field of programmed instruction assisted significantly in advancing knowledge in the field and in using this knowledge.

AN ADJUNCT TO SELF STUDY. Meyer, Donald E. Behavioral Sciences Laboratory, Wright Patterson AFB, Ohio. EDRS Order No. ED 019 590, price MF $0.25, HC $.55. 9p. 1966.

Two experiments were conducted to evaluate a self-study program prepared within two operational fighter-interceptor squadrons. Based on a technical order manual, it consisted of sequenced multiple-choice questions with a simple punchboard as a confirming device. In experiment one, two operational squadrons were divided into two groups judged to be at comparable levels of knowledge as based on a pretest. During the 11 days of the experiment, the experimental group spent just over four hours on self-instruction, mostly going over the program twice, while the control found its classroom lectures interrupted by temporary duty and extended alerts and spent slightly more than one hour. The experimental group did better on the post-test and liked the program and it was completely within the capabilities of the squadron to prepare the materials. In the second experiment, the time was controlled. The experimental group went over the program twice, spending an average of 253 minutes while the control group was given 250 minutes of lecture over five days. Again the experimental group scored better on a post-test, over one-fourth scoring as high or higher than the highest in the control group. This self-study technique, with its simple materials prepared on-site within an operational squadron, appears suitable for refresher training in the modern defense structure with its isolated sites and dispersal requirements.

V. INSTRUCTIONAL MATERIALS

DEVELOPMENT OF A PROGRAMMED TEXT IN SALESMANSHIP FOR FEASIBILITY TESTING IN ADULT EDUCATION. Final Report. Russell, Raymond B. Kansas State Teachers College, Emporia. Department of Business and Business Education. EDRS Order No. ED 003 851, price MF $0.09, HC $1.35. 25p.

The objectives of this project were to develop a programmed text of about 1,200 frames in salesmanship for use in distributive education adult classes in small towns and to evaluate the possibilities of continuing this type of program without further federal financing. Promotion of the text was carried on in ten Kansas towns with populations between 2,000 and 7,000. Six communities adopted the program and there was a total enrollment of 267 (with 241 completions). The text, initially consisting of six chapters with 1,075 frames, was field tested on 15 students for clarity and conciseness, and then was reviewed for pertinency of information by an advisory committee of local business leaders. The program had to conform to an I.Q.range of 70-140, an age span of 20 to 50, and a median grade completion level of about ten years. The enrollments and the high rate of course completion suggest that adults in smaller communities will accept programmed instruction in salesmanship, and the relatively low cost per man-hour of instruction is more efficient, at least in financial terms, than traditional college extension.

SELF-STUDY PROGRAM IN RETAIL STORE OPERATIONS, UNITS 1-13 AND STUDY GUIDE. Quaker Oats Co., Chicago, Illinois. EDRS Order No. ED 017 713, price MF $3.00. Hard copy available from Quaker Oats Company, 345 Merchandise Mart Plaza, Chicago, Illinois 60054, price $4.95. 777p. 1965.

The purpose of this self-study program is to provide a comprehensive view of total retail food store operations and to broaden the knowledge and understanding of those in or students and others preparing to enter the food industry. It was developed by the Quaker Oats Company for its salesmen but was expanded for use outside the company. The program consists of 13 separate self-study units and a study guide. The individual units vary from 40 to 72 pages in length, and each requires about 2 hours to complete. The units are (1) the grocery industry, past, present, and future, (2) from the producer to the consumer, (3) the supermarket today, (4) profit and the supermarket, (5) the supermarket customer, (6) the grocery department, (7) the meat department (8) the produce department, (9) the dairy department, (10) the frozen foods department, (11) the bakery department, (12) the front end, and (13) other departments in the supermarket. The program incorporates programmed learning as the self-instruction method. In addition to programmed learning the units contain text material, diagrams, and illustrations. In a study of the effectiveness of the program by Western Michigan University, a comparison of pre- and post-test results for a typical group of store employees showed a significant improvement in the knowledge level of the group.

ANIMAL NUTRITION. PROGRAMMED INSTRUCTION UNITS, ANIMAL NUTRITION, FEED CHARACTERISTICS, VITAMINS, MINERALS. FINAL REPORT NUMBER 12. Long, Gilbert A. Washington State University, Pullman. EDRS Order No. ED 010 663, price MF $0.18, HC $5.60. 110p. December 1966.

Principles and facts necessary for effective animal nutrition practices were identified by examination of recent scientific reports. Utilizing this information, the author involved 16 vocational agriculture teachers in the development and experimental use of a unit of programmed learning materials. Instructional results were not available at the time of reporting. There was substantial evidence, however, that teacher involvement activated the analytical assessment of objectives and interest in innovative instruction.

LAND JUDGING AND PLANT NUTRITION, A PROGRAMMED INSTRUCTION UNIT, REPORT NUMBER 13. Long, Gilbert A. Washington State University, Pullman. EDRS Order No. ED 010 664, price MF $0.18, HC $4.35. 85p. December 1966.

A unit of programmed learning materials was presented on the principles and procedures of land judging and plant nutrition. In his preparation, the author first identified principles and facts necessary for effective land classification and plant nutrition by examining relevant scientific reports. Using this information, he then formed a team of 16 vocational agriculture teachers to develop and tentatively evaluate the programmed materials. These teachers were engaged in experimental use of the materials at the time of reporting, and evidence of instructional results was not then available.

AUTOMOTIVE DIESEL MAINTENANCE. PROGRAM OUTLINE. Human Engineering Institute, Cleveland, Ohio. EDRS Order No. ED 021 149, price MF $0.25, HC $1.20. Also available from the Human Engineering Institute, Headquarters and Development Center, 2341 Carnegie Avenue, Cleveland, Ohio 44115. 22p. 1 March 1968.

Informational topics covered in the text materials and self-instructional branch programmed training films for a two-year, 55 module program in automotive diesel maintenance are given.

AUTO MECHANICS; METHODOLOGY, TECHNICAL INSTRUCTION MANUAL. Systems Operation Support, Inc., King of Prussia, Pennsylvania. Sponsoring Agency- Office of Education (DHEW), Washington, D. C. EDRS Order No. 023 786, price MF $0.50, HC $4.10

This student instruction manual was written in conformance with selected criteria for programmed instruction books as developed previously for various military training courses. The manual was developed as a part of "A Study of the Effectiveness of a Military-Type Computer-Based Instructional System When Used in Civilian High School Courses in Electronics and Automechanics" (VT 006 916). The material concentrates upon knowledge required for logical and systematic gathering of symptoms, analysis of these, and a logical step-by-step methodology of isolation to a section, a component, renewal and replacement or direct repair of the component and then an operational check to determine that the automobile will perform satisfactorily. Subject matter

areas and sub-topics include (1) ignition system, (2) fuel system, (3) engine analysis and (4) tune-up procedures. The activities included are those which can benefit the most from a systematic approach applicable generally to any problem which might arise.

DEVELOPMENT OF A RETAILING INSTRUCTIONAL SYSTEM FOR DISTRIBUTIVE EDUCATION. FINAL REPORT, NUMBER 26. Idaho University, Pocatello. Department of Education: Washington State Coordinating Council for Occupational Education, Olympia; Washington State University, Pullman. Department of Education. EDRS Order No. ED 023 889, price MF $0.25, HC $2.55. 49p. August 1968.

The purpose of the project was to develop a polysensory multimedia programmed instruction presentation which could teach non-college-bound youth competencies necessary for entry level employment in the general merchandise retail field. Instructional systems concepts were used in preparing for field testing nine subsystems of instruction in retailing. Sub-systems were: (1) Salesperson's Job, (2) Qualities of a Salesperson, (3) Customers' Buying Motives, (4) Selling Process, (5) Merchandise Information, (6) Cash Register Operation, (7) Stockkeeping Task, (8) Retail Recordkeeping, and (9) Working with People. Prototype components which include 23 booklets of programmed instruction and eight audiscan sound slidefilms have been developed for the instructional sub-systems of Cash Register Operation, Stockkeeping Task, Retail Record Keeping, and Working with People.

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